

## **FIRE LADDER WITH WIRELESS DEPLOYMENT**

### **BACKGROUND OF THE INVENTION**

5 The invention relates to safety and security devices and methods and particularly to apparatus and methods for the emergency escape from the window of a building. One such emergency situation may occur during a fire. Similar situations may arise in the event of seismological or terrorist activity.

10 Security is a primary concern of homeowners. Due to the fact that people tend to place a high value on their property and personal safety, the marketplace has responded with a variety of products that are intended to protect life and property. One product that has seen wide use is the emergency escape  
15 ladder often used on two or three story homes and buildings. This chain ladder is unrolled or otherwise deployed from a window. Then the person climbs down to safety. While this process sounds easy, there are several steps involved with this process. In some known fire ladder constructions the ladder must be retrieved from its storage location. Second, it must be hooked to the window sill, hopefully in a secure fashion. Finally, the ladder must be  
20 unrolled, hopefully in an untangled manner.

The prior art includes a variety of ladders that can be deployed in such emergency situations. These include the devices shown in United States patents 6,382,352 issued on May 7, 2002 to Dowe, Sr.; 4,157,130 issued on  
25 June 5, 1975 to Aberer; 4,164,991 issued on August 21, 1979 to Marra; 4,189,028 issued on February 19, 1980 to Reinhard; 4,31,046 issued on April 26, 1983 to Landem; 4,434,871; and 4,531,612 issued on July 30, 1985 to Sandor. The disclosures of these issued United States patents are hereby incorporated by reference.

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The inventions described therein do provide additional safety of our buildings that do not have such ladders. However, they have not been wholly satisfactory. One concern is that a child or even a very distressed adult when

confronted with smoke and danger may be traumatized and not deploy a conventional fire ladder. Particularly, in buildings where a number of occupants are trapped, panic is even more likely to complicate the manual deployment of a fire ladder. It must be remembered the required deployment  
5 steps are occurring under an emergency situation, where smoke, darkness, fear, unfamiliar surroundings and the like may be present.

#### SUMMARY OF THE INVENTION

10 It is an object of the present invention to provide an additional measure of safety over known fire ladders.

More particularly, it is another object of the invention to provide a ladder that will automatically deploy upon the occurrence of a fire within the premises  
15 being protected.

Still another object of the invention is to provide apparatus that will respond to seismological and/or terrorist activity.

20 It has now been found that these and other objects of the invention may be attained in a system and method to facilitate escape from a building in an emergency which includes apparatus for monitoring at least a part of a building for a life threatening conditions selected from the group consisting of fire, seismological and terrorist threats. The system also includes a fire ladder  
25 having a compact position and a deployed position. The fire ladder in the deployed position extends generally vertically. The system further includes apparatus for mounting the fire ladder proximate to the lower edge of an associated window in the building and apparatus for releasably retaining the fire ladder in the compact position. In addition the system further includes  
30 apparatus for releasing the fire ladder that is responsive to the apparatus for monitoring.

In some forms the invention the apparatus includes photoelectric apparatus, ionization apparatus, fuzzy logic, Boolean logic, and/or one or more

thermistors. The fire ladder may include a manual release for the ladder. The system may include a radiofrequency transmitter and a radiofrequency receiver.

- 5 The rungs of the ladder may have projections dimensioned and configured to rest against the side of the associated building when the ladder is deployed along the side of the associated building.

The objects of the present invention may also be achieved with the method to  
10 facilitate escape from a building in an emergency which includes monitoring at least a part of a building for a life threatening conditions selected from the group consisting of fire, seismological and terrorist threats, providing a fire ladder having a compact position and a deployed position, and which in the deployed position extends generally vertically and has rungs, mounting the  
15 fire ladder proximate to the lower edge of an associated window in a building and releasably retaining the fire ladder in the compact position, and releasing the fire ladder that is responsive to the monitoring step.

In some forms of the method in accordance with present invention, the  
20 monitoring step is performed with at least one of the complements selected from the list that includes: photoelectric apparatus, ionization apparatus, fuzzy logic, Boolean logic, a radiofrequency transmitter and at least one thermistor.

#### BRIEF DESCRIPTION OF THE DRAWING

25 The invention will be better understood by reference the accompanying drawing illustrating schematically the window of a building and a fire ladder in combination with a wireless control system for deploying the ladder in the event of a fire. While the present invention has primary application for  
30 residential applications and emergencies such as fire, it will be understood that the invention also has application for other structures including commercial buildings and that the apparatus also has application to other emergency conditions including criminal invasions, terrorist acts and seismological events.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the figure, there is shown a system and method in accordance with one form of the present invention. The building on which the system is installed includes a smoke detector 12 that is connected to a radiofrequency transmitter 14. In the more sophisticated embodiments of the invention the system also includes a conventional security system 16 that includes a more sophisticated fire sensing apparatus and a control panel. The precise nature of this more sophisticated apparatus may vary without departing from the spirit of the present invention.

Examples of such more sophisticated fire sensing apparatus are shown in the following United States patents having the same assignee as the present application:

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| 6,150,935 | One in and Fire Alarm System With Discrimination Between Smoke And Non-Smoke Phenomena issued on November 21, 2000 to Anderson; |
| 6,084,522 | Temperature Sensing Wireless Smoke Detector issued on July 4, 2000 to Addy  |
| 5,781,291 | Smoke detectors utilizing a hydrophilic substance issued on July 14, 1998 to So, et al.   |
| 5,764,142 | Fire alarm system with smoke particle discrimination issued on June 9, 1998 to Anderson, et al.                                 |
| 5,726,633 | Apparatus and Method for Discrimination of Fire Types issued on March 10, 1998 to Wiemeyer;                                     |
| 5,659,292 | Apparatus including a fire sensor and a non-fire sensor issued on August 19, 1997 to Tice.                                      |
| 5,633,501 | Combination photoelectric and ionization smoke detector issued on May 27, 1997 to Amieshi, et al.                               |
| 5,557,262 | Fire alarm system with different types of sensors and dynamic system parameters issued on September 17, 1996 to Tice.           |

- 5,117,219 Smoke and Fire Detection System Communication issued on May 26, 1992 to Tice, et al. one system to turn to move will
- 4,916,432 Smoke and Fire Detection System Communication issued on May 26, 1992 to Tice, et al. one
- 4,374,329 Smoke Detector with Test Apparatus issued on February 15, 1983 to Schoenfelder, et al.
- 4,316,184 Combination Combustion-Product Detector issued on February 16, 1982 to Nagel.
- 4,225,860 Sensitivity Controlled Dual Input Fire Detector issued on September 30, 1980 to Conforti.
- 4,097,851 Sensitivity Compensated Fire Detector issued on June 27, 1978 to Klein.
- 4,091,363 Self-contained Fire Detector with Interconnection Circuitry issued on May 23, 1978 to Siegel, et al.
- 4,020,479 Fire Detector issued on April 26, 1977 to Conforti, et al.

The disclosures of the above referred to patents are incorporated herein by reference. Various embodiments of the present invention may utilize different  
 5 fire and smoke detecting means. In the simplest embodiment a conventional smoke detector will simultaneously produce an audible alarm and send a signal to the transmitter 14.

In some cases, the fire detection system includes apparatus for discrimination  
 10 between various types of fires as described in United States Patent 5,726, 633 (referred to above). That apparatus relies on the characteristics of the smoke to determine the type of fire producing smoke. As noted therein flaming fires exhibit quite different smoke characteristics than smoldering fires. As also noted therein the different types of smoke sensors respond differently  
 15 depending on the fire type. Thus, photoelectric detectors are known to respond more rapidly to smoldering fires than are ionization-type detectors. Similarly, ionization-type detectors are known to respond more rapidly to flaming type fires than do photo-electric detectors. The same patent describes fuzzy logic and Boolean logic techniques for analysis of such data.

As described in United States patent 6,084,522 (referred to above) temperature sensing in combination with a smoke detector is also useful. For example various embodiments may include a photoelectric sensor for determining the presence of smoke and a plurality of thermistors for providing  
5 a temperature signal reflective of a temperature level.

A signal from the transceiver 14 is preferably a wireless radiofrequency signal that will be recognized by the receiver 18. Various embodiments may use other infrared other wireless data transfer means to transmit a signal to the  
10 receiver 18.

The receiver 18 is coupled to a fire ladder 20 disposed below a conventional window 22. The receiver 18 one receiving a signal from the transmitter 14 releases the fire ladder 20. The fire ladder 20 may be constructed in the  
15 general manner shown in the various United States patents listed in the Background of the Invention section of this application.

The fire ladder 10 will preferably include a manual release to permit deployment by the user in the event of any failure of the portion of the system  
20 that includes a fire and/or smoke detector. In addition the respective steps are preferably shaped so that individual steps include projections that extend toward the side of the building (on which the apparatus is mounted) a sufficient amount to stabilize (by physical contact) the ladder with respect to the side of the building. A ladder construction having nesting rigid generally  
25 U-shaped rungs as shown in United States patent 4,434,871 lends itself to projections that extend horizontally from each rung. It will be understood that the ladder may be collapsed after use and stowed ready for deployment again at some future time.

30 The invention also includes the method to facilitate escape from a building in an emergency which includes monitoring at least a part of a building for a life threatening conditions selected from the group consisting of fire, seismological and terrorist threats, providing a fire ladder having a compact position and a deployed position, and which in the deployed position extends

generally vertically and has rungs, mounting the fire ladder proximate to the lower edge of an associated window in a building and releasably retaining the fire ladder in the compact position; and releasing the fire ladder that is responsive to the monitoring step.

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In some forms of the method in accordance with present invention the monitoring step is performed with features selected from the group selected from the group photoelectric apparatus, ionization apparatus, fuzzy logic, Boolean logic, a thermistor, and a radiofrequency transmitter. The providing step may include providing a manual release for the ladder.

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The method may also be with a performing step that includes providing rungs of the ladder that have projections dimensioned and configured to rest against the side of and associated building when the ladder is deployed along the side of the associated building.

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Although the description herein has emphasized fire responder personnel those skilled in the art will recognize that the apparatus in accordance with the present invention has application to other emergency situations. For example, other forms in the invention may include seismological monitoring equipment either in combination with the above described apparatus or as a substitute for the fire detection apparatus. The seismological monitoring equipment may include conventional sensing devices known in the art. The prior art includes various automobile and building alarms that rely on impact and/or concussion to initiate an alarm. While the sensitivity of such systems is not directly applicable for use with fire ladders, those skilled in the art will recognize that the general type of sensors employed therein may be utilized to initiate deployment of a so-called "fire ladder" in the event of earthquakes as well as acts of war or terrorism. For purposes of this application "seismological monitoring equipment" will be understood to include equipment that can detect major acts of war as well as terrorism in addition to earthquakes and related phenomenon and "seismological events" includes earthquakes and earthquake related phenomenon as well as major acts of warfare and terrorism.

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The respective methods and systems in accordance with the present system may utilize a computer that includes a microprocessor and memory and which cooperates with software that is commercially available or within the skill of  
5 practitioners in the programming arts.

The term "fire ladder" has been used herein. Such apparatus also has application to other life threatening situations in addition to the threat from fire.

10 The use of the present invention provides a means of safe egress from the upper floors of a building in the event of a fire or other emergency that can be quickly deployed in a manner which is safe, quick and effective.

15 It will be obvious to those having skill in the art that many changes may be made to the details of the above-described embodiments of this invention without departing from the underlying principles thereof. Accordingly, it will be appreciated that this invention is also applicable to other systems. The scope of this invention should, therefore, be looking reasonable boom in and out a determined only by the following claims.